

Guidelines for Environmental Sampling at Illegal Drug Manufacturing Sites

**(Formerly, Appendix C from *Guidelines for
Contamination Reduction and Sampling at Illegal
Drug Manufacturing Sites*)**

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For more information:
www.doh.wa.gov/ehp/ts/cdl.htm

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Environmental sampling for volatile organic compounds, methamphetamine and caustics is an important component in characterizing septic wastes, screening soils, determining levels of methamphetamine and presence of corrosives. Sampling results can be used to assess the degree and extent of contamination, support unfit for use and release for reuse determinations, and guide decisions regarding decontamination procedures

This guideline describes recommended procedures for the collection, handling and transportation of, septic, soil, methamphetamine and caustic samples. Standard operating procedures (SOP) are required to ensure collection of representative samples that are accurate and defensible. Modification of procedures may be acceptable and the guidelines are intended to allow flexibility. However, any deviation from the SOP outlined in this guideline should be documented in the sampling plan as to the extent of and reason for the deviation. Deviations should be pre-approved by local health staff before sampling is conducted.

Sampling shall be conducted only by qualified personnel as defined in WAC 246-205-531(2) "Collection of samples shall be performed by department of ecology staff; department of health certified CDL supervisors; or local health officers..."

I. GENERAL RECOMMENDATIONS:

A. EQUIPMENT AND SUPPLIES:

OBJECTIVE: To use equipment and supplies required for conducting valid environmental sampling projects.

Equipment Purchased From Either a Certified Laboratory or Laboratory Supply Company:

Filter papers

Sample collection containers

Analytical grade methanol

Disposable templates

Sludge judge

Disposable plastic pipette

Squeeze bottle

pH Indicator paper

Laboratory grade distilled water
(ASTM Type II)

Cooler

Analytical Request/Chain of Custody
Form

Supplies Purchased From Retail Stores:

Field notebook

Stainless steel spoon

Large stainless steel container

Disposable templates

Disposable gloves

Thumbtacks

Masking Tape

Permanent ink marking pen

Permanent ink ball-point pen

Labels for collection containers

2 Equipment storage containers*

Caddy

Pre-moistened hand wipes

Zip lock bags

Ice or frozen ice packs**

Camera

Distilled water

Paper towels

Trash bags

PPE

Chain of Custody Seals

* One storage container for off-site
and one for on-site

** Must be able to maintain 4° C

A. EQUIPMENT AND SUPPLIES (continued)

1. Use equipment from either a certified laboratory or a laboratory supply company. Supplies can be purchase at retail stores.
2. Equipment and supplies should be clean (sterilized if required) and in proper working condition before using.
3. Store equipment/supplies in a clean, secure storage container designated for only sampling media/supplies. Storage container is kept in a limited access area to avoid any type of contamination and is never brought on to a drug lab site.
 - a) Decontamination contractors are accountable for the safe custody of all sampling equipment from the time they receive it from the analytical laboratory until the time they use it and relinquish it back to the laboratory.
 - (1) Signed or initialed chain of custody seals should be maintained on appropriate equipment/supplies.
4. Store and transport sampling equipment/supplies separate from PPE and all other equipment used to decontaminate properties.
5. Use equipment/supplies only one time and properly dispose of upon completion of the sampling project.
 - a) Exceptions to this rule exist and include supplies such as the caddy, “on-site” equipment storage container and stainless steel tools, which may be reused after proper decontamination.
6. Whatman 40 filter paper is recommend, however, the following have equivalent performance; Whatman 41, 42, 43, 44, 540, 541, Ahlstrom 54, VWR 454 and S&S WH Medium.
7. Sample collection containers consist of; standard laboratory 4-ounce containers and 40ml vials. All containers have Teflon lined lids.
8. Templates should be thin (less than 3mm), capable of lying flat on a surface and stiff enough to maintain their shape. Area sampled is 100 cm² (10cm by 10 cm).
9. Gloves should be powder-less to minimize contamination from the powders.

B. OFF-SITE SAMPLING PREPARATION

OBJECTIVE: To minimize contamination of sampling equipment and supplies and increase sampling efficiency when on-site.

1. Verify that the sampling plan has been pre-approved by the local health department. Sampling plan should include detailed descriptions of sampling techniques for each matrix being sampled (surface wipes, soils and septic tanks), sample location and type (single or composite).
2. Review approved sampling plan and determine what equipment/supplies are needed to conduct the sampling project. Bring extras for unexpected occurrences and store them in the on-site storage container until needed. Note that the on-site storage and mailing containers are not brought into the contaminated/decontaminated area.
3. Conduct sampling preparation before going on site.
4. Lay out a disposable surface cover (such as a plastic tablecloth), in an area free from contamination, to use as your preparation site.
5. Put on gloves.

B. OFF-SITE SAMPLING PREPARATION (continued)

6. Pre-label sampling collection containers using permanent ink. Each container must have a securely affixed label containing the following information.
 - a) Site ID – record the facility (ex. Use the address number)
 - b) Sample ID – assign a number
7. Prepare a blank. (Note: If you take 4-point composite samples, the blank should consist of 4 filter papers).
8. Place sampling equipment and supplies needed for the sampling project into the on-site storage container.

C. ON-SITE SAMPLING PROCEDURES

OBJECTIVE: To collect representative samples in a consistent manner that can be replicated.

1. Eating, drinking smoking or other activities that may introduce contamination, is prohibited during on-site sampling procedures.
2. Conduct sampling with two people. One person is designated as the “Sampler,” and the other person is designated as the “Record Keeper.” It is recommended that both the “Sampler” and the “Record Keeper” meet the qualifications of WAC 246-205-531(2) and be certified cdl supervisors.
3. Put on appropriate PPE.
4. Conduct a walk-through to ensure site is ready to sample.
5. Transfer equipment/supplies from on-site storage container to caddy. Do not bring storage container into the contaminated area.
6. Continue with additional steps, outlined below, for on site sampling procedures for methamphetamine, VOCs and caustics.

D. FIELD QUALITY CONTROL (QC)

OBJECTIVE: To evaluate precision of the sampling process.

1. Field quality control samples typically consist of blank, duplicate and equipment rinsate samples. It is at the discretion of the local health staff to determine which QC samples are taken. Often staff will waive the collection of duplicates or rinsates for soils or septic sampling for the reason that at the initial stage of investigation, sampling is being conducted to determine if potential contamination exists. Based upon initial sample results, additional sampling, including QC samples, may be required at the discretion of the local health staff.
2. MEDIA BLANK:
A media blank is taken for methamphetamine wipe samples. The media blank is prepared off-site by the contractor and consists of placing a filter paper into a sample collection container, wetting it with methanol and tightly securing the lid. The container is carried on site, never opened and returned to the laboratory for analytical analysis.
3. FIELD DUPLICATE (REPLICATE):
A field duplicate consists of independent samples that are collected as close as possible to the same point in location and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently.
 - a) Methamphetamine: Historically, duplicate wipe samples have been taken to have “back up” samples in case a sample container breaks in transport or

D. FIELD QUALITY CONTROL (QC) (continued)

for potential legal proceedings. However, since methamphetamine's holding time has not been established, duplicate samples are no longer taken for these purposes. If for some reason, duplicates are taken, they are submitted to and stored by the analytical lab. CDL Contractors would not keep duplicates due to lack of ability to maintain conditions necessary to preserve sample integrity.

- b) Methamphetamine: Duplicates are not taken to evaluate precision of sampling process due to the variability of sampling media (the non-uniform dispersion of methamphetamine residue).

4. EQUIPMENT RINSATE:

An equipment rinsate consists of rinsing the sampling equipment with laboratory grade distilled water (ASTM Type II) after the equipment has been decontaminated and prior to sampling. The rinse water is collected and analyzed.

E. CHAIN OF CUSTODY RECORD

OBJECTIVE: To provide accountability for and documentation of sample integrity from the time sample equipment is received from the laboratory until the samples are transferred, by signature, to a courier or analytical laboratory.

1. Use a custody record supplied by the analytical laboratory.
2. Chain of custody begins when contractor receives equipment from the analytical laboratory. CDL contractor is responsible for the care and custody of sampling equipment. Chain of custody seals should be maintained on stored equipment. Each time a seal is broken, it is initialed, dated and recorded. A new custody seal is placed on remaining equipment being stored for future use.
3. The assigned field sampler is responsible for care and custody of samples collected until they are properly transferred by signature to a courier or laboratory.
4. As few people as possible should handle samples.
5. Use permanent ink to enter the following information:
 - a) Project Name
 - b) Sampling Site Address
 - c) Sample Number (#125-1) (Do not put down location of the sample)
 - d) Sample Date (Date sample was taken)
 - e) Sample Time (Time sample was taken)
 - f) Sample Type (Single, composite)
 - g) Sampled area (100, 400 cm²)
 - (1) For Media Blank Sample: Record an area that is consistent with the area you typically sample and the number of wipes submitted with the media blank sample (100 cm²/wipe).
 - h) Analysis Requested (Methamphetamine, VOC)
 - i) Field Notes (suspect high concentration in sample # 125-1, noted strong solvent odor)
 - j) Number of Containers
 - k) Report In: (Keep analytical results consistent with area sampled. If 400 cm² was sampled, then results would be reported in 400 cm².)

E. CHAIN OF CUSTODY RECORD (continued)

- l) Turn Around Time
- m) Signatures of sampling personnel
- n) Signatures of all personnel handling and receiving samples
- o) Date and Time (samples received)

F. TRANSPORTATION OF SAMPLES

OBJECTIVE: To preserve integrity of samples through proper transportation.

1. Place methamphetamine and VOC samples in a cooler, filled with ice, immediately after collecting the sample. Temperature of 4°C must be maintained.
2. Package containers in cooler in a manner that prevents breakage.
3. Complete analytical request and chain of custody form.
4. Place form inside a waterproof, zip lock bag and include it with the mailing.
5. Attach chain of custody seal to outside of cooler.
 - a) Sign and date custody seal.
6. Deliver by mail courier service or personal delivery, samples to analytical lab within 24 hrs of completing sampling.
7. Retain shipping receipts.

G. DECONTAMINATION PROCEDURE FOR EQUIPMENT/SUPPLIES

OBJECTIVE: To avoid cross contamination through proper decontamination of equipment and supplies.

1. Decontaminate using the following procedure:
 - a) Wash the item thoroughly with soap and water. Recommended soaps are Liquinox or Alconox.
 - b) Rinse the item thoroughly with distilled water.
 - c) Rinse stainless steel equipment with analytical grade methanol.
 - d) Air dry.
 - e) Wrap stainless steel supplies in aluminum foil.

H. SITE CLEAN UP AND PERSONNEL DECONTAMINATION:

OBJECTIVE: To avoid cross contamination through proper waste disposal and personnel decontamination.

1. Dispose of used and unused sampling equipment into trash bags.
 - a) Dispose of trash bags at cdl contractor's office location.
2. Remove PPE and dispose of in trash bags.
3. Decontaminate PPE that will be reused.
4. Store PPE separate from sampling equipment/supplies.
5. Wash hands with pre-moistened hand wipes or soap and water.

I. SAMPLE LOG FORM OR FIELD NOTEBOOK:

OBJECTIVE: To sufficiently document in a factual way, field sampling activities to allow review of all aspects of sampling.

1. Document all field-sampling activities on a sample log form or in a bound all weather notebook with sequentially numbered pages.

I. SAMPLE LOG FORM OR FIELD NOTEBOOK (continued)

2. New field notebooks are required for each sampling project to avoid cross contamination between projects.
3. Use permanent ink and record information in a legible manner.
4. Correct errors by drawing a single line through the error so it remains legible, and adjacent to the error, have the responsible individual date and sign the correction.
5. Document any deviation from approved procedures in the sampling plan.
6. Maintain field book in an accessible location that protects it from damage and loss.
7. Record the following standard information in field notebook:
 - a) Project Name
 - b) Project Address
 - c) Date of Project
 - d) Name of personnel and tasks they performed
 - e) Purpose of Project
 - f) Arrival and Departure Times
 - g) Field instruments used
 - h) Instrument calibrations
 - i) Sample Number
 - j) Sample Location
 - k) Surface Type
 - l) Time each sample was taken
 - m) Weather
 - n) Pertinent conversations
 - o) Sign each page

J. HANDLING AND STORAGE OF METHANOL

OBJECTIVE: To reduce risk of personal injury and cross contamination of methanol.

1. Methanol is a toxic and flammable liquid and must be handled and stored with all safety precautions related to toxic and flammable liquids.
2. Store small amounts of methanol and frequently replenish supply.
3. Place a signed or initial chain of custody seal over bottle top and neck.
4. Inhalation of methanol vapors must be avoided. Containers must be handled in a ventilated area.
5. Protective gloves should be worn when handling containers with methanol.
6. Methanol should be stored away from open flames, areas of extreme heat and other ignition sources.

II. METHAMPHETAMINE WIPE SAMPLES

OBJECTIVE: To collect wipe samples from hard, non-porous surfaces from areas of 100 cm² (10cmx10cm) with methanol-moistened filter papers, using a specified pattern of wiping. Samples are taken from dry or relatively dry surfaces.

A. OFF-SITE SAMPLE PREPARATION

1. Follow steps described in “I-B. OFF-SITE SAMPLING PROCEDURE,” and continue as described below:
2. Remove lids from sampling collection containers, placing them top down on a contamination free surface.
3. Put on clean pair of gloves.
4. Fold filter papers in quarters and insert in sampling collection containers. Only one filter paper per container.
5. Saturate filter papers with methanol until wet but not dripping (approximately 40 drops or 2mls). If too much methanol is added, pour off excess onto paper towel and dispose of properly.
6. Secure lids tightly on containers and replace in shipping box.
7. Pre-label templates to match with labels on sampling collection containers.
8. Place other equipment/supplies in zip lock bags that are then placed in the “on-site” storage container. Take only the equipment/supplies needed for the sampling job to the drug lab site.
9. Prepare sample log form/field notebook.

B. ON-SITE SAMPLING PROCEDURE FOR SINGLE SURFACE WIPES

1. Proceed to first sampling location;
 - a) Wash hands with pre-moistened hand wipes,
 - b) Record Keeper and Sampler put on clean gloves,
 - c) Record Keeper hands a template and thumbtack to the Sampler
 - d) Sampler attaches template to pre-designated sampling location. Take precautions not touch the area within the template.
 - e) Proceed to next sampling locations and repeat procedure. When finished securing templates, return to each sampling location and Record Keeper takes a photo of each template that includes a point of reference.
 - f) Sampler and Record Keeper put on clean gloves.
 - g) Record Keeper removes the corresponding sampling collection container and fills in required information on container label.
 - h) Information consists of date and time sample was taken.
 - i) Record Keeper unscrews the container lid (always keeping the lid in their hand).
 - j) Sampler removes filter paper from container and inspects the filter paper to determine that it is still wet. If it has dried out do not use it. Use one of the extra sample collection containers you brought for unexpected occurrences.
 - k) Keep the filter paper folded in quarters.
 - l) Grasp the folded filter paper between the thumb and fingers. Place the filter paper on the surface to be sampled. Press down firmly, but not excessively with the fingers, being careful not to touch the sample surface with thumb.

B. ON-SITE SAMPLING PROCEDURE FOR SINGLE SURFACE WIPES (continued)

- m) First Wipe: Using firm pressure, vertically wipe, the surface within the template side to side in overlapping “Z” pattern. Wipe so that the entire

selected surface area is covered. End with a scooping motion. Avoid wiping the template.

- n) Second Wipe: Open the wipe and fold the sampled side in. With a clean quarter section exposed, horizontally wipe the surface within the template side to side in overlapping “N” pattern. Wipe so that the entire selected surface area is covered. End with a scooping motion. Avoid wiping the template.
- o) Fold the filter paper so the sampled side is folded in.
- p) Blot rough surfaces uniformly, instead of wiping.
- q) Sampler inserts the folded filter paper into sample collection container.
- r) Record Keeper secures lid and places container back into cooler with ice (cooler is not brought into the contaminated/decontaminated area).
- s) Repeat sampling procedures outlined above at each sampling location, making certain to change gloves.
- t) Follow steps I-E, “Chain of Custody Record” thru I-I, “Sample Log Form.”

C. ON-SITE SAMPLING PROCEDURE FOR COMPOSITE SURFACE WIPES

1. A composite sample is the collection of samples taken from different locations that are combined and analyzed as a single sample. A methamphetamine composite sample may consist of up to four sample locations. It is at the discretion of the local health staff to determine where to take composite samples.
2. Separate filter papers are used for each sample location. If you are taking a 4-point composite, then four filter papers are used. Before sampling, each filter paper is stored in individual containers to prevent wetted filter papers from sticking together and ripping.
3. Follow the same sampling procedures outlined for single surface wipe samples with two exceptions:
 - a) The same pair of gloves may be used to collect each single sample that will be combined into a composite sample. However, use a fresh pair of gloves for each set of composite samples.
 - b) Upon completion of sampling for a composite, all the filter papers used to take the composite sample are placed in one sample collection container. Only one sample collection container is used to store the “dirty” composite wipes.

D. FIELD QUALITY CONTROL

1. MEDIA BLANK:
 - a) A blank consists of the off site preparation of placing a filter paper into a sample collection container, wetting it with methanol and tightly securing the lid. The container is taken to the sampling site, not opened and returned to the analytical laboratory. No surface is wiped. A blank is used to verify that sampling equipment is not contaminated.

D. FIELD QUALITY CONTROL (continued)

- b) The blank should be consistent with the other samples. For example, if all samples are four point composites, the blank should consist of four filter papers. When filling out the chain of custody form, in “area sampled,” for a media blank, you would put “400 cm².”

III. WASTEWATER SAMPLING

Objective: To collect samples, utilizing methods that minimize volatile losses, from potentially impacted tanks for the purpose of characterizing waste.

A. CONDUCT OFF-SITE SAMPLE PREPARATION AS OUTLINED IN I-B (OFF-SITE SAMPLING PREPARATION)

1. SAMPLING LOCATION IN TANKS WITH ONE CHAMBER:
 - a) Samples are collected from the baffle on the outlet end of the tank.
2. SAMPLING LOCATION IN TANKS WITH TWO CHAMBERS:
 - a) Samples are collected from the baffle on the outlet end of chamber one.
3. Conduct Off-Site Sampling Preparation outlined in “I-B.”
4. Prior to sampling, the septic tank must have been sufficiently excavated to indicate whether the tank consists of one or two chambers.
5. Transfer sampling equipment/supplies from on-site storage container to sampling caddy.
6. Remove access cover from the first (or only) chamber and locate outlet baffle.
7. Move any floating surface matter away from the insertion point of the sludge judge. Do not collect any matter in the sludge judge.
8. Follow instructions for correct usage of a sludge judge.
9. Insert the sludge judge into the tank, lowering it until you hit the bottom.
10. Trap the sample inside the sludge judge.
11. Remove the sludge judge and fill two 40ml vials.
12. Samples may be taken with out preservative (procedure “a”) or with preservative (procedure “b”) in the vial. Sampling procedure is determined by the sampler’s confidence and ability to maintain sample integrity.
 - a) FIELD SAMPLE TAKEN WITHOUT A PRESERVATIVE IN THE VIAL
 - (1) Notify and coordinate with the analytical laboratory that you will be submitting unpreserved samples.
 - (2) Empty the collected sample into a stainless steel or glass container that is large enough to hold the entire amount.
 - (3) Use a pipette, or stainless steel cup to fill vial to the top, leaving no headspace.
 - (4) Secure the lid. Check for air bubbles by slapping the vial’s side against the palm of your hand and turning the vial upside down. If there is an air bubble larger than a pea, remove the lid and add more sample. Repeat until no air bubbles larger than a pea exist.
 - (5) Place sample containers in cooler with enough ice or ice packs to maintain temperature of 4° C.

B. ON-SITE SAMPLING PROCEDURES (continued)

- (6) Samples with no preservatives must be immediately delivered or mailed to the laboratory.
- b) FIELD SAMPLE TAKEN WITH A PRESERVATIVE IN THE VIAL
 - (1) Empty the collected sample into a stainless steel or glass container that is large enough to hold the entire amount.
 - (2) Use a pipette, or stainless steel cup to fill vial to the top, leaving no headspace. Take extra precaution not to cause overflow, resulting in loss of the preservative.
 - (3) Secure lid. Check for air bubbles by slapping the vial's side against the palm of your hand and turning the vial upside down. If there is an air bubble larger than a pea, remove the lid and add more sample. Repeat until no air bubbles larger than a pea exist. Take extra precaution not to cause overflow, resulting in loss of the preservative.
- 13. Place sample containers in cooler with enough ice or ice packs to maintain temperature of 4° C.
- 14. Follow steps I-E, "Chain of Custody Record" thru I-I, "Sample Log Form."
- 15. Replace access cover.

B. FIELD QUALITY CONTROL

- 1. It is at the discretion of the local health staff to determine which QC samples are taken. Often staff will waive the collection of duplicates or rinsates wastewater sampling. The reason for this is that at the initial stage of investigation, sampling is being conducted to determine if potential contamination exists. Based upon initial sample results, additional sampling, including QC samples, may be required at the discretion of the local health staff.

IV. SOIL SAMPLING

OBJECTIVE: To collect bulk samples, utilizing methods that minimize volatile losses, from potentially impacted areas for the purpose of screening for VOCs.

A. CONDUCT "OFF-SITE SAMPLE PREPARATION" OUTLINED IN "I-B"

B. ON-SITE SAMPLING PROCEDURES

- 1. The following procedure is for collecting soil within one to six inches of the soil surface. Designate one individual as the "Sampler" and the other as the "Record Keeper."
- 2. Transfer sampling equipment/supplies from on-site storage container to sampling caddy.
- 3. Use a stainless steel spoon to collect soil to specified soil depth.

B. ON-SITE SAMPLING PROCEDURES (continued)

4. Collect samples from freshly exposed surface by scraping away the top inch of soil.
5. Collect and transfer the sample quickly with minimal disruption to its physical state.
6. Minimize collection of rocks, sticks and other debris.
7. Fill two 4 oz containers to the top by firmly packing soil in container, leaving no headspace. Two containers are filled to ensure the laboratory has enough soil to conduct analysis.
8. Secure lids.
9. Place containers in shipping cooler with enough ice or ice packs to maintain temperature of 4° C.
10. Follow steps I-E, "Chain of Custody Record" thru I-I, "Sample Log Form."

C. FIELD QUALITY CONTROL:

1. It is at the discretion of the local health staff to determine which QC samples are taken. Often staff will waive the collection of duplicates or rinsates for soils sampling. The reason for this is that at the initial stage of investigation, sampling is being conducted to determine if potential contamination exists. Based upon initial sample results, additional sampling, including QC samples, may be required at the discretion of local health staff.

V. SAMPLING FOR CORROSIVES

OBJECTIVE: To collect samples from non-porous, hard surfaces to identify caustic areas that need to be neutralized or designated as dangerous waste.

A. ON-SITE SAMPLING PROCEDURE

1. Put on a clean pair of gloves.
2. Pour a small amount of deionized water onto indicator strip.
3. Touch the indicator strip to the surface to be sampled.
4. Remove the strip and compare the resultant color with the kit's color key.
5. Repeat steps 1-4 as necessary.

VI. WATER SAMPLING

LAKES, STREAMS AND OTHER SURFACE WATER SAMPLES

A common method for collecting water from ponds, lakes and streams is by dipping the sample bottle to obtain water at or near the surface. This technique is effective because many chemicals remain on the water surface. If physical conditions preclude the dip method or if subsurface samples are needed, alternate methods are available using a sampling jar attached to a telescoping pole, hand pumps, or weighted water samplers.

A. SAMPLING PROCEDURE

1. Collect at least one liter of water into a certified clean glass jar and secure with a Teflon-lined lid. Avoid collecting sediments.
2. Label jar, attach custody seal, and prepare sample for transport to the laboratory.

SURFACE SLICK SAMPLES

If water depth prevents dipping a bottle to collect a slick on the water surface, the preferred method is the “saturation” pad technique. It may be appropriate to composite several pads for a single sample. Do not re-dip a pad or use both sides to collect a surface slick. Collected material can be washed away if the pad is re-dipped.

A. SAMPLING PROCEDURE

1. Fold an 11 cm filter paper (Whatman 40 ashless or equivalent) or gauze pad into a 2.5 cm square.
2. Grasp the pad firmly with stainless steel forceps and saturate the pad with the slick. Roll the pad into a cylinder and place into a glass jar and secure with a Teflon-lined lid.
3. Label jar, attach custody seal, and prepare sample for transport to the laboratory.

WELL WATER SAMPLES

Purging the Well - “Purging the well” means removing the volume of water standing in the well casing and/or in the water distribution system and replacing that water with new water from the aquifer. The purpose is to insure that a representative sample of the aquifer is collected.

A. SAMPLING PROCEDURE

1. If there is no tap at the well head, use the closest tap to the well head.
2. Purging is not necessary on wells which are pumped continuously, but measurements of temperature, conductivity (the ability to conduct an electric current) and pH should still be recorded. If a well is pumped dry during the purging process, it may be considered adequately purged and the sample can be collected as soon as the well casing is recharged.
3. Flow may be diverted with a hose during the purging process, but the hose must be removed before samples are collected.

One of the following methods should be used:

Method One

Open the tap all the way and allow water to flow into a catch bucket. Water should flow for approximately five minutes before readings are taken for conductivity, temperature, and pH. After five minutes and while water continues to flow, conductivity, temperature and pH should be measured at approximate one minute intervals until three consecutive readings indicate that parameters have stabilized. Readings may be considered stable when temperature measurements vary by no more than $\pm 0.5^{\circ}\text{C}$, conductivity readings vary by no more than $\pm 1\%$ and pH readings vary by no more than ± 0.1 pH unit. It may be assumed that the source is adequately purged when stable readings for two parameters are obtained. After readings have stabilized, remove the hose and begin sampling.

Method Two

Three to five well casing water volumes (storage volumes) should be purged from the well.

The storage volume is calculated as follows:

1. Volume (V) = $3.14 \times R^2 \times D \times 7.48$ gal/ft³
V = Borehole volume (gallons)
R = Radius of the well bore (feet)
D = Depth of well (feet)
2. Flow should be measured using a five-gallon bucket and a stopwatch. Record readings in the field notebook.
3. Calculate the amount of time (in minutes) that the well should be purged in order to remove the required 3-5 times the well volume:

Time = 3 (or 5) x Volume of borehole (in gal) required flow rate (in gal/min) in minutes

4. After the required minimum volume has been purged and while water continues to flow, conductivity, temperature and pH should be measured at approximately one minute intervals until three consecutive readings indicate that parameters have stabilized. These measurements should be recorded in the field notebook. Samples should be collected after the required well volume has been purged and readings for conductivity, temperature, and pH have stabilized.

FIELD MEASUREMENTS

Specific conductivity, pH and temperature should be measured on-site and during purging of the well. Well water should be pumped continuously into a bucket or other container until three consecutive readings taken at one minute intervals indicate the three parameters have stabilized.

1. Conductivity - The conductivity of a water sample gives an indication of the concentration of dissolved solids in the water.
 - a) Conductivity should be measured with a temperature-compensated instrument, reading directly in micromhos/cm at 25°C. The cell should be checked before initial use and unless otherwise stated by the manufacture. The instrument should be calibrated daily during regular use against a 0.00702 N potassium chloride (KCl) solution with a specific conductivity of 1,000 micromhos/cm at 25°C. Routine checks are made by using a standard solution within the anticipated conductivity range of the sample at ambient temperature.
2. Temperature - Temperature should be recorded by an electronic reading thermometer or mercury thermometer accurate to $\pm 0.5^\circ\text{C}$.
3. Hydrogen Ion Concentration (pH) - The pH of a solution is a measure of the effective hydrogen ion concentration. It should be measured with an instrument having an accuracy of 0.1 units. Since pH is temperature sensitive, it is important that pH calibration standards be within $\pm 1^\circ\text{C}$ of the sample solution for precise determinations.

SAMPLE COLLECTION

1. Samples should be collected as close to the well as possible, from a tap located before the water has passed through any pressure or water storage tanks or treatment systems. If it is not possible to collect a sample from the water system before the well water storage tank, then the volume of water in the storage tank must be taken into account when purging the system.
2. There should be sufficient space to place the bottle under the tap without grazing the neck interior against the faucet.
3. Leaking taps which allow water to flow out from around the stem of the valve handle and down the outside of the faucet, or taps in which water tends to run up on the outside of the lip, should be avoided as sampling locations.
4. Aerator, strainer, and hose attachments on the tap should be removed before sampling. If a steady stream of water cannot be obtained from the tap after removing such devices, a more suitable tap should be sought.
5. Water flow should be steady to avoid dislodging material lining the inside of the pipe. A smooth-flowing stream at moderate pressure without splashing should be obtained. Water flow should not be adjusted immediately prior to or during actual sample collection.
6. Excessive flow and the resulting turbulence can affect metals, volatile organics, and many other chemicals. Samples should be disturbed as little as possible (e.g., turbulence, agitation, and exposure of water sample and containers to the atmosphere).
7. During sample collection, the bottle cap should not be placed on the ground or in a pocket. The bottle should be held in one hand and the cap in the other, keeping the bottle cap right side up (threads down) using care not to touch the inside of the cap. Be careful to avoid losing the Teflon liner in certain bottle caps. Avoid contaminating the sample bottle with fingers or permitting the faucet to touch the inside of the bottle. When filling any container, care should be taken that splashing drops of water from the ground or sink do not enter either the bottle or cap. A clean polyethylene sheet placed on the ground may be helpful in maintaining a clean work area.
8. Samples should be labeled and held on ice, if required, immediately after collection.
9. Samples should be collected in the following order:
 - 1) Volatile Organic Compounds (VOC)
 - 2) Other Organic Compounds, Metals and Inorganics

Volatile Organic Compounds (VOC)

1. Samples to be analyzed for purgeable organic compounds should be taken in 40 ml vials and secured with screw caps containing a Teflon septum.
2. Two vials should be filled for each sample.

3. The investigator should determine if the water to be sampled contains chlorine. If the water contains no chlorine, two 40 ml vials, each containing 2 drops of 1:1 HCl, should be filled with the sample and labeled. If the sample contains no chlorine **and only if** the sample will be analyzed within 24 hours, preservation with HCl is not necessary.
4. Samples should be collected before chlorination or other pre-treatment if at all possible. If this is not possible and the sample contains chlorine, the following procedure for sample collection and preservation should be followed:
5. Fill a 40 ml vial, containing 10 mg sodium thiosulfate, to the shoulder (where the vial necks down to the top) with sample, add 2 drops of 1:1 HCl, then fill completely with sample. Label the vial.

NOTE: Sodium thiosulfate and acid preservatives should be added in this order and in two separate steps because HCl reacts with sodium thiosulfate.

6. Vials should be completely filled, with no air bubbles. Extreme caution should be exercised when filling a vial, to avoid any turbulence which could also produce volatilization. The sample should be carefully poured down the side of the vial to minimize turbulence. As a rule, it is best to gently pour the last few drops into the vial so that surface tension holds the water in a "convex meniscus." The cap is then applied and some overflow may be lost, but air space in the bottle is eliminated. After capping, turn the bottle over and tap it to check for bubbles; if any are present, discard the sample and sample bottle and repeat the procedure with a new bottle.

Other Organic Compounds, Metals, and Inorganics

1. All containers and tubing, used for collection of samples for other organic compounds, metals and inorganic analysis, should be prepared as provided by standard cleaning procedures.
2. When possible, the sample should be collected directly into the appropriate sample container. If this cannot be physically accomplished, an intermediate collection device may be used, such as a smaller sampling bottle, which has been cleaned according to standard procedures.

REFERENCES

American Society for Testing and Materials
D4840 –99 Chain-of-Custody Procedures

American Society for Testing and Materials
E 1728-99 Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques

American Society for Testing and Materials
D 4547 Sampling Waste and Soils for Volatile Organic Compounds

United States Department of Housing and Urban Development
Lead Wipe Sampling for Contaminated Dust

United States Environmental Protection Agency
EPA SW 846-5035
EPA 600/4-82-029 Handbook for Sampling and Sample Preservation of Water and Wastewater